

we have certain signs due to the foreign body and the local reaction set up by it, and others due to changes in the lung supplied by that bronchus. The character of the foreign body is important; a safety-pin may do little damage while a peanut causes marked changes very rapidly. One foreign body plugs a bronchus completely, another acts as a ball valve. Pus forms below the foreign body and may be retained or escape. The secretions may be forced into bronchi other than the one involved, or from the affected lung into the bronchi of the opposite one, so that signs are found on both sides. The signs may change greatly from hour to hour in acute cases so that any set description fitting all cases is out of the question.

1. THE FREQUENCY OF FOREIGN BODIES IN THE BRONCHI. It is quite impossible to give any statement on this point. In the Jefferson Hospital material they are comparatively common, but this is exceptional, as the patients come from all parts of the United States and Canada to consult Dr. Jackson. Two things suggest that such cases are more common than we have generally supposed. One is the number of patients who come with a history which shows that for months or years a foreign body has been present and unsuspected and the other is the number of patients from the near neighborhood with a foreign body, but without suspicion of it on their part. The roentgen rays have aided greatly in the recognition of certain foreign bodies, but there are substances which do not show in a roentgen-ray plate, and it is for the recognition of these that a study of the physical signs is particularly important. Certainly, the impression has been strongly forced upon me that the condition is much more common than the majority of us have suspected and my memory brings up cases seen in the past in which the presence of a foreign body was probably overlooked.

One point deserves emphasis in this connection—the history. Most of us would suppose that there would be small chance of a foreign body passing into the trachea and then to a bronchus without marked acute symptoms which could not fail to be noticed. We must realize that this is not necessarily the case and that fairly large bodies may reach the bronchi without any acute symptoms. For example, in one case (No. 611³) there was no definite history as to when the foreign body, which was an atomizer tip, had been aspirated. The patient knew nothing of it, but on searching his memory remembered that about eighteen months before a tip had disappeared. This particular patient had been thought to have tuberculosis. At the time of writing this paper a boy of eight years of age is under observation. He was sent to the clinic for some laryngeal condition and examination shows part of a collar-button in a bronchus. No history can be obtained of any acute

³ The numbers are those in Dr. Jackson's series, and are given to identify the cases when reported elsewhere.

onset and there is no clue as to the time of aspiration. Such cases emphasize the need of caution in concluding that the introduction of a foreign body must cause some symptoms or disturbance which can be noted. This point cannot be too strongly emphasized.

My impression is that these unrecognized cases of foreign bodies in the bronchi are by no means rare. Naturally the greatest difficulty arises in the instances in which the body cannot be recognized by the roentgen rays, probably in from 10 to 15 per cent. of all cases. There are two sharply defined groups of unrecognized cases. The first is that in which the body sets up a very acute inflammatory process and death follows in a short time—the diagnosis of pneumonia usually being made. This is particularly likely to follow the aspiration of some variety of nut, especially a peanut, by a young child, and how many of these cases occur we have no means of knowing. The younger the patient the more acute this process usually is and in such cases it is evident that the history is often not complete. The other group is that in which marked changes are set up and the symptoms become chronic, a diagnosis of pulmonary tuberculosis or bronchiectasis being made. In such a case in an adult seen some years ago there were marked signs over the lower right lobe. We suspected the possibility of a foreign body but there was no history to suggest it and repeated roentgen-ray examinations did not aid. After eighteen months of illness she coughed up a small piece of bone. This was followed by rapid recovery.

2. CLINICAL FEATURES CAUSED BY FOREIGN BODIES. The greatest possible diversity occurs as the signs vary markedly. A safety-pin, particularly if closed, is not likely to cause much change in a short time while a screw or tack which plugs a bronchus results in rapid changes. One substance may plug a bronchus or set up inflammation which does the same thing, and another may entirely plug a bronchus at one time and a little later allow air to enter past it, so that it is evidently impossible to give any exact account of the signs. The foreign body is more often on the right side and has a tendency to go to the bronchi supplying the lower lobes.

The change in the signs in a short interval is a striking point. In some cases this is apparently due to a change in position of the foreign body, in others air may enter at one time and not at another. Thus in one patient the signs suggested collapse of the involved lobe and a few hours later it was apparently overdistended, suggesting a valve action of the foreign body. The amount of secretion and the effect of coughing on its expulsion may cause rapid changes in the signs. The signs may be local or general; it is not uncommon to find signs over both lungs. Emphasis should be placed on this point, as in some cases the signs are more diffuse on the unaffected side. This may lead to serious error and appears most likely to occur in the younger patients.

There is only one sign which has been present in every patient seen by me, and that is *decreased expansion* of the affected side. It may be the only sign present, as in the following case:

No. 697. The patient was a woman, aged thirty-two years, who, two weeks before, coughed while holding a safety-pin in the mouth and aspirated it. She felt some soreness in the throat, followed by a tickling sensation and a hacking cough. Two days later she had more severe coughing, followed by pain in the upper right chest. On admission she complained of slight cough and pain in the *right* side of the chest. On examination there was *only one sign* to be found—diminished expansion of the *left* side. The percussion note and the breath sounds were clear. No rales were heard. In view of this the opinion was given that the foreign body was on the left side, but that there was no clue to its position beyond that. The roentgen ray showed an open safety-pin in the left bronchus without any evidence of a pathological process in the lung beyond the pin. Dr. Jackson removed the pin and three hours afterward the expansion was absolutely equal on the two sides.

In some cases it has been possible to hear rales, which may be described as rather characteristic, over a small area. In each case in which they have been observed the foreign body was metallic, but the cases are too few to draw any positive conclusions. These particular rales may be described as very fine and softer than the early crackling rales heard in lobar pneumonia. They may be compared to the crackle made by very fine tissue paper. In the two cases given there was no other evidence of any change in the lung tissue made out by physical or roentgen-ray examination.

No. 683. The patient was a girl, aged eighteen years, who was having some dental work done on December 23, 1918. A dental root-canal reamer was placed in the tooth and the dentist turned to get another instrument. The patient felt the reamer slip out of the tooth and lodge on the tongue. She tried to take hold of it, but it disappeared. She had a paroxysmal attack of coughing but did not feel any sensation of a foreign body in the throat or air passages. Two days later she took ill with what was regarded as an attack of influenza, with which she had a severe cough and considerable sputum. After this she was very weak and had some cough, which was slightly productive. She complained of an occasional sharp shooting pain in the lower left thorax, which seemed to be brought on by coughing. On admission on January 31, 1919, examination showed slightly less expansion of the lower left thorax. The percussion note seemed equal on the two sides. The breath sounds were very feeble on both sides, and this seemed to be rather more marked over the lower left lobe. In the lower left axilla there were very fine crackling rales, which

seemed to come from a distance. They were heard mostly at the end of inspiration and were slightly more marked on deep breathing, but were never loud. There were no definite signs of any solidification in the lung tissue. The roentgen-ray study showed the foreign body in the left lower lobe bronchus. There was no evidence of change in the lung beyond it. The reamer was removed on February 1. Dr. Jackson found the trachea very red and inflamed. The left bronchus showed a high degree of inflammation, with adherent masses of thick secretion which surrounded the foreign body, part of which was in the posterior branch of the left inferior lobe bronchus.

It is certainly surprising that there were not more signs with this degree of change in the bronchus. Two days later there was still slightly less expansion of the lower left side and a very few of the fine, crackling rales could be heard on deep breathing.

No. 690. The patient, a man, aged fifty-six years, was seen on March 15, 1919. On March 7, while standing on a ladder holding a staple in his mouth, he endeavored to answer a question and aspirated the staple. He did not have any symptoms at the time. The next day he complained of tickling in the throat, and a roentgen-ray examination was made which showed the staple in a bronchus. An attempt at removal was made (in another place), but was not successful. At the time of examination the patient stated that the roentgen ray showed the staple in the *left* lung and pointed to the third left interspace as the spot where he felt it. The importance of not accepting a patient's statement as accurate was shown by the examination. This was complicated by the fact that he evidently had old trouble on the right side, and he stated that he was thought to have had tuberculosis in youth. The right shoulder was lower, there was less expansion, the right scapula was longer and moved less, and there was dulness, with harsh breath sounds at the right apex. The percussion note was equal in the two axillæ, but in the lower right axilla there were fine rales at the end of inspiration heard over a small area. These seemed to come from a distance and were extremely fine. They were the same as those heard in case No. 683. No rales were heard on the left side. Despite the positive statement by the patient that previous roentgen-ray studies had shown the staple in the left lung and that he could feel it there, these rales suggested that it was in the right lower lobe bronchus. The roentgen-ray study (Dr. Manges) showed a metal staple in the main bronchus of the lower right lobe and very little pathology in the lung below the staple. Dr. Jackson found the staple in this situation and removed it. The fine crackles were heard unchanged three hours after the removal, but had disappeared the following day.

One hesitates to give too much importance to these rales, but they are different from rales which I have heard in any other condition,



FIG. 1.—Case 690. Staple in right lower lobe of bronchus. Little change below the foreign body.

and have only been heard in cases in which the foreign body was metallic in character. They are certainly worth keeping in mind,

but it is well to state that very careful listening is required to hear them. They might easily be missed in a hurried or perfunctory examination.

The next stage of the development of the signs is found when changes have occurred in the lung. An example is as follows:

No. 684. This patient was a boy, aged three years, seen on January 31, 1919. The history was that on December 21, 1918, it was noticed that the patient had something in his mouth which was suddenly aspirated. A severe coughing attack followed and the patient was blue for a time. In the next two or three days repeated coughing attacks occurred and there was a slight elevation of temperature. The patient was attended by a physician who made a diagnosis of influenza and later of pneumonia on the left side. During this time the patient seemed to be very ill and had fever, which occasionally reached 104° , with very severe cough and considerable pain in the left side of the chest. Examination was difficult, as the child was crying constantly and was very restless. The expansion was diminished on the right side. The percussion note was clear and hyperresonant on the left side, but on the right side there was some impairment on percussion throughout, slight in the upper part and most marked in the lower right front, axilla and back. The breath sounds were clear throughout the left side and not a single rale was heard. On the right side, on quiet breathing, expiration was not heard, but was distinctly audible when forcible expiration was made. In general the breath sounds were distant over the right side. In the upper part of the right chest the breath sounds were rather higher pitched than normal, but were not tubular. There were many coarse, crackling rales in the lower right interscapular region and a certain number in the lower axilla. After forcible coughing the rales changed somewhat, becoming rather fewer. There was no wheeze heard. The signs suggested that the foreign body was in the lower right bronchus. Dr. Jackson removed a machine screw from the right inferior lobe bronchus. Large amounts of pus escaped during the operation and were coughed up subsequently.

It is interesting to note how frequently the diagnosis of pneumonia is made in these cases. This comes out very frequently in the histories, but a careful study of the physical signs should prevent this error. Fever is very common after the aspiration of a foreign body, and if there is dyspnea, with cough and bloody or blood-streaked sputum, the diagnosis of pneumonia is suggested before the examination of the thorax is made. Decreased expansion on one side and dullness may suggest the diagnosis, but a careful study of vocal fremitus and the auscultatory signs should show that if the condition is pneumonia there is plugging of the bronchus—a rare

condition. The writer has not seen pneumonia associated with any case of foreign body in a bronchus. The local signs are usually those

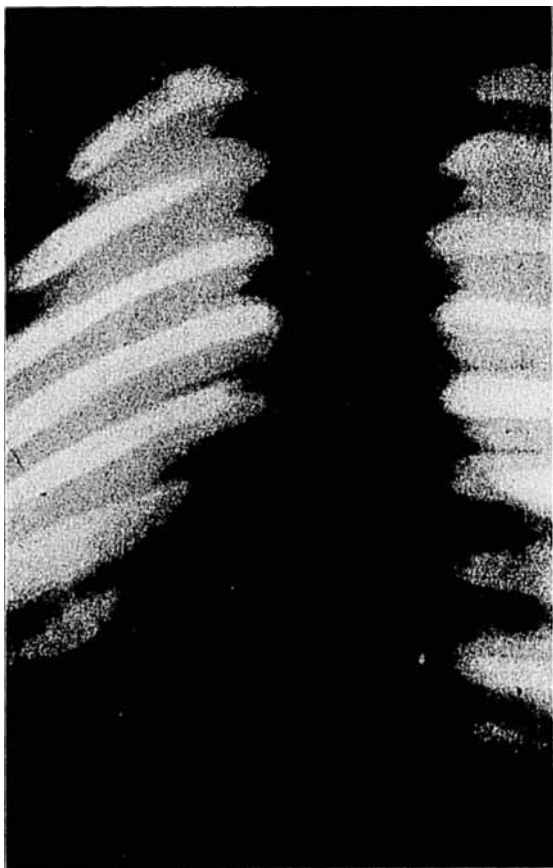


FIG. 2.—Case 684. Foreign bodies in bronchi.

due to the supplying bronchus being obstructed. Variations depend on the quantity of air in the portion of lung, the amount of

secretion and the persistence and completeness of the plugging of the bronchus. In many cases there are no breath sounds or rales heard over the affected parts, in others there may be rales but no breath sounds. In the majority the affected portion of lung seems to be airless and in the roentgen-ray plates at early stages shows as a homogeneous shadow. Later fibrosis, abscess formation and bronchiectasis may be found. These show no special peculiarity in the physical signs, but are important in that they may be wrongly diagnosed as tuberculosis.

"**ASTHMATOID WHEEZE.**" This term has been employed by Chevalier Jackson to describe a sign which is present in a considerable number of cases of foreign body in the trachea or bronchi. He has discussed it in considerable detail in a recent article.⁴ This sound can be heard by placing the ear or the bell of the stethoscope close to the patient's mouth. It may be heard with both inspiration or expiration, but sometimes is only audible at the end of forced expiration. Forcible respiratory effort usually increases the loudness and intensity. It differs from the wheezing sounds heard with bronchial asthma, but this difference is difficult to describe in words. The "wheeze" varies in pitch and loudness, depending on the character of the foreign body causing it. In no case in which the writer observed it could the sound be heard over the chest wall. In some cases the sound comes and goes without any explanation being evident. The report of a case in which it was very marked is as follows:

No. 675. The patient, a white male, aged forty-four years, was admitted on December 20, 1918, complaining of cough and shortness of breath. Four days before admission a dentist was fitting a gold bridge, when it slipped back in the mouth and was aspirated. Following this there was a paroxysm of coughing and the patient had a momentary sensation of a foreign body in the throat. The same evening he had an attack of dyspnea, which lasted for about half an hour and which he compared to asthma. With this there was an unproductive cough. With the coughing he had noted a certain amount of wheezing. On examination on December 21, 1918, the patient was propped up in bed. He had slight dyspnea but no cyanosis. On listening with the ear near the patient's mouth a wheezing sound was heard, most marked with inspiration and very slightly heard with expiration. It seemed to be rather more marked when he took a deep breath. Expansion was much less over the lower right chest. On percussion there seemed to be slightly less resonance on the right side which was most marked in the lower right axilla and back. The breath sounds in general, were rather harsh and this was more marked on the

⁴ AM. JOUR. MED. SC., 1918, clvi, 625.

right side. No rales were heard on the left side, but there were a great many over the whole of the right lung. They were of very variable character, the majority whistling and groaning, and some with rather a wheezing character. The roentgen rays showed an artificial dental plate, apparently composed of three teeth in the right upper bronchus. Removal was done on December 21, and immediately after it the wheezing sounds heard at the mouth disappeared. Two days after removal expansion of the two sides of the chest seemed absolutely equal, percussion was clear, no rales were to be heard and the breath sounds seemed to be equal on the two sides.

This sign appears to be of considerable value, particularly in the cases in which the foreign body does not show in the roentgen-ray plate. It has been observed in many cases and occurs with different substances. It should be listened for in all cases of obscure thoracic diagnosis in which the presence of a foreign body has to be considered.

Certain foreign bodies set up very acute and dangerous changes, among which the *peanut* takes first place. It sets up a rapid and severe reaction and the younger the child the more severe this is. The following is an example:

No. 682. The patient was a boy, aged five years, who on December 20, 1918, choked while eating peanuts. There was much coughing and gagging, with cyanosis at the time. Later the symptoms subsided, but in the evening the father noted that there was a wheezing sound at intervals, with a dry cough. Until January 7, 1919, the patient seemed well and played as usual. On this date the cough increased in severity and there was severe dyspnea, but the wheezing ceased. The physician said that air was not entering the left lung. On January 14 an attempt was made to do bronchoscopy (in another city), but without success. The patient was admitted to the Jefferson Hospital on January 16, 1919. On examination he was comfortable and showed neither distress nor cyanosis. Over the right side there were harsh breath sounds, with many medium and coarse rales. The left side of the thorax showed decided fulness, but no expansion. Vocal fremitus was difficult to obtain, but seemed much decreased. The percussion note had a curious quality of tympany, with an element of dulness. The breath and voice sounds were not heard over the left side. No rales were heard. The heart was not displaced. We considered that the peanut had acted as a ball valve and allowed air to enter but not to escape. The roentgen ray confirmed this, and after the removal of the peanut showed an equal amount of air in the two lungs.

The larynx was found to be much swollen and the trachea greatly inflamed. There was pus coming freely from the right

main bronchus. The left bronchus was intensely red and swollen and contained tenacious pinkish pus. After sponging this away the peanut was seen in the left bronchus. It was removed without crushing. After removal the left side still showed decreased expansion, but harsh breath sounds could now be heard, with many loud bubbling rales. Within four days the child felt well and the signs in the chest had nearly cleared. There was still less expansion, with the percussion note and breath sounds about normal.

This case illustrates one point which may cause error—the presence of signs on both sides. This is usually due to secretions from one side being forced or carried over to the opposite bronchus. Occasionally a foreign body may be moved from one side to the other, or, in the case of a nut portions may be broken off and carried over. It may be said, however, that there is rarely any doubt of the side involved if a careful examination is made. The decreased expansion is the most important guide in deciding this point. Special reference must be made to the need of care in the peanut cases, as a general process is set up in both lungs and the roentgen-ray plate may show more pathological changes on the side which does not contain the nut.

To this condition the term *Arachidic Bronchitis* has been applied by Jackson and Spencer.⁶ They apply this term to the condition set up by the presence of a peanut in the respiratory tract, but other nuts give much the same symptoms. The clinical picture is rather a distinctive one associated with an edematous, purulent tracheobronchitis which often results in lung abscess. The cases appear only in children and the symptoms come on rapidly, with high fever, severe toxemia and marked thoracic signs. The dyspnea is extreme, cyanosis is usually marked and there may be a purulent tenacious sputum. The fever is usually irregular, but is high for part of the day. The signs are general and are those of an intense general bronchitis, with a great variety of rales, the majority coarse and bubbling. There is decreased expansion on one side as a rule, but if portions of the nut are on both sides, as sometimes happens, this does not hold. Depending on the size and situation of the particles there may be dulness and absence of breath and voice sounds if a bronchus is plugged. The lung supplied by the plugged bronchus contains much secretion and has been described as "drowned lung." This is often mistakenly regarded as representing pneumonic consolidation. The "asthmatoïd wheeze" is present in a majority of the cases. The voice is usually lost.

"We should always remember the possibility of peanut bronchitis when consulted regarding a child who rather suddenly develops irregular fever, restlessness, dyspnea with cyanosis, paroxysmal

⁶ Jour. Am. Med. Assn., 1919, lxxiii, 672.

cough and the signs of a diffuse, generalized bronchitis, attended with wheezing respiration. A history of choking on a peanut, or of eating peanuts at about the time of inception of the illness, renders the diagnosis almost certain." (Jackson and Spencer.)

3. As regards the question of distinctive signs of foreign bodies one speaks with great hesitation. The two signs mentioned certainly deserve careful study, namely, the presence of the fine "tissue-paper" rales over a small area and the "asthmatoïd wheeze." The former has been observed with small metallic bodies only, but further observations may show that it occurs with others. They are not necessarily present in every case of small metallic bodies. The "wheeze" seems to offer more as a suggestive sign; Dr. Jackson has now observed it in over 50 cases, so that it seems to be of much importance. I venture to suggest the value of keeping it in mind and noting its presence or absence in doubtful cases.

In the very acute cases, usually due to some substance such as a nut or burr, the marked general signs may be of value, especially if there is any history. The problem is complicated by the presence of fever, which may be high, and the general picture of an acute infection. Some of these patients present a picture of the most intense toxemia. A general picture suggestive of a severe bronchopneumonia, but without any positive physical signs of it, should excite suspicion of something else.

The occurrence of signs in a lower lobe for which there is no evident explanation should always suggest the possibility of a foreign body. The same may be said to be true of local signs anywhere the etiology of which is not clearly proved.

4. As regards physical signs suggestive of a particular kind of foreign body, in the absence of a positive history one hesitates to speak with any certainty. One might *suspect* but it seems difficult to be *sure*. Evidently this is most important in the cases in which the roentgen rays give no aid. In such instances the acute general signs caused, for example, by a peanut are perhaps as suggestive as those of any group.

5. THE REDUCTION OF ERRORS IN DIAGNOSIS. It is evident that errors will be fewer if the possibility of a foreign body is considered. Too often it is not thought of and a hasty examination, soon after the entrance of a foreign body, results in a careless diagnosis, usually of pneumonia, which is not revised. This seems the only explanation when the changes due to a foreign body are diagnosed as tuberculosis, and this is accepted for years. In general, foreign bodies tend to go downward and set up changes in the lower lobes. It seems to take a great deal of telling to convince some of us that tuberculosis at the base of a lung alone is very rare. In every case of basal involvement, in every case of abscess and of bronchiectasis the possibility of a foreign body should be considered.

In the acute cases, typically illustrated by the reaction to a

peanut, the problem may be more difficult, but the suggestions given by Jackson and Spencer are an aid. The picture is in some ways like a very acute severe bronchitis with bronchopneumonia, but it reads more like it in the description than it looks like it in the patient. It is one of the differences which is difficult to state in words, but is suggested at once after one has seen the patients. The intense toxemia, marked dyspnea and cyanosis, and high fever without any signs of pneumonia, are points to be noted.

SUMMARY. 1. Cases of foreign body in a bronchus are not mere curiosities but are more common than we have supposed.

2. There may be no disturbance at the time of entrance of a foreign body and no suggestion in the history of such a happening.

3. Certain signs are of value, especially decreased expansion on the affected side, the presence of very fine rales and the "asthma-toid wheeze."

4. Some foreign bodies, such as a peanut, set up a very acute general process which is fairly distinctive. Other structures, such as metallic objects, cause permanent changes, usually in a lower lobe.

5. The chief errors in diagnosis are to mistake the signs for those of pneumonia in the early stages and in the acute cases, and for tuberculosis after the body has been present for some time.

THE OCULOPUPILLARY FIBERS OF THE SYMPATHETIC SYSTEM: DIVISION OF THE FIRST THORACIC ROOT IN MAN.¹

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It is surprising that so little is known regarding the course of the sympathetic fibers in the brain; especially is this true of the cerebrum. We have evidence as to the location of the oculopupillary fibers of the sympathetic system in the cervical cord, medulla oblongata and pons, but scarcely anything is known of these fibers in their relation to higher parts of the brain. My attention has been directed at this time only to the oculopupillary fibers of the sympathetic system. Paralysis of these fibers produces the Claude Bernard-Horner syndrome. It is not definitely known that this paralysis occurs with hemiplegia of cerebral origin, but a case in which it seems to have so occurred has come under my observation and has led to investigation of the literature bearing on this subject.

¹ Read before the Philadelphia Neurological Society, November 21, 1919.